Zebra and Quagga Mussel Veliger Sampling Protocol
Vertical Tow *
California Department of Fish and Wildlife

*This protocol was adapted from the California Department of Water Resources *Zebra and Quagga Mussel Veliger Sampling Protocol for the State Water Project,* April 29, 2008.

Before collecting plankton samples make arrangements with a laboratory that has the capability to process the samples.

Zebra and quagga mussels have a planktonic larval lifestage (microscopic, free-swimming in water column) and are called veligers. Veliger size range is 70-200 microns (µm).

Equipment

- 63-µm plankton tow net (maximum mesh size)
- Rope, 50 meters
- Sample bottles (250 mL)
- Sample labels
- Sharpie pen
- Plankton Sample Log (on waterproof paper)
- Plankton Sample Datasheet (on waterproof paper)
- Ice chest with crushed ice/blue ice
- Wash bottle(s) filled with tap water
- 5-gal bucket ("wash down" bucket)
- White vinegar, 100% solution (3 to 5 gal or enough to submerge plankton net and tow rope)
- 5-gal bucket with lid ("vinegar decontamination bucket")
- Chlorine solution, 10% bleach (16 to 32 oz or enough to fill spray bottle)
- Spray bottle for chlorine solution (16 to 32 oz)

Field Procedures

Sampling Method – Vertical plankton tow

To optimize the likelihood of capturing veligers if they are present, tows should be made at various locations within a lake/waterbody. It is recommended that 8 to 16 separate tows (depending on the size of the waterbody), of at least 8 meters each in length be made. Sample at a variety of areas, including near boat ramps, open water, near water outflows and inflows, downwind areas, and eddies, or areas where plankton collects (i.e., behind islands, etc). You may also want to sample the entire depth of your water column. To do this, lower the net to 1 meter above the bottom and pull up to the surface. Individual waterbodies (size, depth, productivity, suspended solids, etc.) and equipment (net diameter, mesh size) will vary, so adjust sampling accordingly. Individual tows from the same lake/waterbody can be combined into a single sample jar for laboratory analysis.

To perform a tow, attach rope to the “bridle” (the rope system fixed to the mouth of the net). Gently lower the net into the water to the desired depth. To retrieve, pull rope back in a steady, unhurried, hand-over-hand motion. Note: Do not pull faster than 0.5 m/s (e.g., if the tow distance is 20 m, retrieval should take 40 seconds). Pulling too fast will cause a pressure wave in front of the net that pushes water and plankton away from the mouth of the net, and as such, does not effectively sample the desired volume of water. Record the distance of each tow on the Plankton Sample Datasheet. Rinse net contents into sample bottle (described below) between each tow.

Sample Collection

Label the outside of the sample jar using a permanent marker, such as a Sharpie, with the lake/waterbody, date, and time.

- At the end of each tow, lift the net so that the net opening is above the water surface. Next, lower the net back into the water (keeping the opening above the water surface) and then quickly pull the net straight up; this action will move the collected plankton into the cod-end piece. Repeat this procedure as needed. Note: If sampling from shore, use a 5-gal bucket of water to wash the contents down into the cod-end. Carefully lower the net into the bucket and lift out quickly to wash the organisms down (again, keep the opening of the net out of the water). Repeat as necessary.
- Depending on the configuration of your net, carefully transfer the net contents to the labeled sample jar. Use the wash bottle to gently rinse down any remaining contents into the jar. Try to minimize the amount of rinse water collected in the sample jar so that subsequent tows from the same lake/waterbody can be added.
- Reattach the cod-end piece to the net and repeat the tow.
- Combine the samples for all the tows into one jar, if possible.

Shipping Samples

Immediately place the sample in an ice chest filled with blue ice or crushed ice. If in the field for more than 3 hours in temperatures above 90° F, use dry ice. It is important to cool down the sample as quickly as possible to prevent the sample from rotting and to prevent larger zooplankton from preying on the veligers. Upon returning from the field, prepare the sample for shipment. Place the sample in a Ziploc baggie, and then pack the sample in a cooler with ice or blue ice. Securely tape the lid closed. Ship the sample using overnight express mail to your lab.

Data Recording

Maintain a log sheet of samples (Plankton Sample Log), and complete a datasheet for each sample (Plankton Sample Datasheet). Fill datasheets out while sampling to ensure accuracy. For the sample log, record the date, location, and time each sample was collected. For individual samples, record the net diameter, mesh size, and distance (i.e., depth) of each tow. Remember to include the units of measurement used. This information may be used to calculate the actual water volume sampled.

Provide sampling data and results to the California Department of Fish and Wildlife quagga contact within your region.

Cleaning and Storing Equipment

To prevent cross-contamination and reduce the risk of spreading zebra and quagga mussels, one plankton net, rope, bucket, etc., is used per site. All sampling gear (including net, rope, wash bottles, buckets, etc) that comes into contact with the water should be soaked in vinegar for a minimum of 2 hours, rinsed, sprayed with or soaked in chlorine solution for 5 minutes, and then thoroughly rinsed with clean tap water (the bleach is corrosive so rinse thoroughly with clean tap water). Dispose of the contaminated rinse water away from the waterbody. The vinegar solution can be reused multiple times. The chlorine solution should be discarded after 24 hours.

Vinegar Solution:
100% white table vinegar (5% acetic acid solution).

Chlorine Solution:
10% solution of household bleach (5.25% sodium hypochlorite). To make the bleach solution, add 1.5 cups of household bleach to 1 gal of water. The bleach solution must be fresh (less than 24 hours old).

Disassemble net and hang to dry. Routinely inspect the net for damage or wear and repair or replace if necessary.

Boat Decontamination

If trailering a boat to a different waterbody, please decontaminate before transporting.

After loading onto the trailer,

- Run the engine for 5-10 seconds to blow out excess water and vegetation from internal drive, then turn off engine.
- Remove aquatic plants and animals from water intake grate, steering nozzle, watercraft hull and trailer.
- Rinse watercraft and equipment with high pressure hot water (140+ ºF) OR dry everything for at least 5 days

Plankton Sample Log
California Department of Fish and Wildlife

Collection Information			
Collector(s):		Affiliation:	
Contact information (email or phone # if not CDFW):			
Samples			
Date	Location	Time	Comments

Return datasheets to the appropriate California Department of Fish and Wildlife Regional office.

Plankton Sample Datasheet

California Department of Fish and Wildlife

(One datasheet per sample)

Collection Information	
Date:	
Waterbody:	
Location (GPS or site description):	
Collector(s):	Affiliation:
Contact information (email or phone # if not CDFW):	

Net
Mesh size*:
Net diameter*:

Tows

#	Location description	Distance/depth of tow*	Comments

Sample Identification Number (optional)
#

Sample Analysis
Shipped to:
Comments:

*Be sure to include units of measurement

Return completed datasheets to the appropriate California Department of Fish and Wildlife Regional office.

CDFW Regional Office Contacts for Quagga Mussel Monitoring

Region 1 – Northern Region

Counties: Del Norte, Humboldt, Lassen, Mendocino, Modoc, Shasta, Siskiyou, Tehama, and Trinity
601 Locust Street, Redding, CA 96001
L. Breck McAlexander
Louis.McAlexander@wildlife.ca.gov
Office: (530) 225-2317
Fax: (530) 225-2381

Region 2 – North Central Region

Counties: Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lake, Nevada, Placer, Plumas, Sacramento, San Joaquin, Sierra, Sutter, Yolo and Yuba
1701 Nimbus Road, Rancho Cordova, CA 95670
Jason Julienne
Jason.Julienne@wildlife.ca.gov
Office: (916) 358-2895
Fax: (916) 358-2912

Region 3 – Bay Delta Region

Counties: Alameda, Contra Costa, Marin, Napa, Sacramento, San Mateo, Santa Clara, Santa Cruz, San Francisco, San Joaquin, Solano, Sonoma, and Yolo
7329 Silverado Trail, Napa, CA 94558
Catherine Mandella
Catherine.Mandella@wildlife.ca.gov
Mobile: (831) 588-1463
Fax: (707) 944-5563

Region 4 – Central Region

Counties: Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Luis Obispo, Stanislaus, Tulare and Tuolumne
1234 E. Shaw Avenue, Fresno, CA 93710
Kelley Aubushon
Kelley.Aubushon@wildlife.ca.gov
Office: (559) 243-4017 X-285
Fax: (559) 243-4004

Region 5 – South Coast Region

Counties: San Diego, Orange
3883 Ruffin Road, San Diego, CA 92123
Russell Black
Duane.Black@wildlife.ca.gov
Office: (858) 467-4262
Fax: (858) 467-4299

Counties: Los Angeles, Santa Barbara and Ventura
4665 Lampson Avenue, Los Alamitos, CA 90720
Eloise Tavares
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Office: (562) 342-7155
Fax: (562) 342-7153

Region 6 – Inland Deserts Region

Counties: Imperial, Inyo, Mono, Riverside and San Bernardino
P.O. Box 2160, Blythe, CA 92226
David Vigil
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Office: (760) 922-4928
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